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AUTHOR Sadker, Myra; Cooper, James
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ABSTRACT

The purpose of this research was to analyze the effects of a teaching methodology on the question-asking behavior of elementary school children. A fifth grade social studies class was chosen as the site of this experiment. The teacher, aided by two interns, divided the class of 24 into three equal groups. The group controlled by the teacher was chosen as the subject of this experiment. Four of the eight students were selected for training in the asking of higher-order questions. The four selected students were presented with instruction and training in higher-order question asking through the microteaching procedure. The higher-order question-asking behavior of these four students was then reinforced in their social studies classroom through token economy. The five phases of the experiment were a) baseline-analysis of classroom interaction during the social studies class, b) microteaching, c) reinforcement, d) no consequation-termination of reinforcement, and e) reinforcement-reinstatement of reinforcement. The results of this study indicate that students can be trained to increase higher-order question asking through the independent variable manipulations put into effect in this experiment. A 26-item bibliography is included. (MJM)

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# MODIFICATION OF THE FREQUENCY OF STUDENT-INITIATED, HIGHER-ORDER QUESTIONS THROUGH MICROTEACHING AND A TOKEN ECONOMY

Dr. Myra Sadker
University of Wisconsin-Parkside

Dr. James Cooper
University of Houston

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# MODIFICATION OF THE FREQUENCY OF STUDENT-INITIATED, HIGHER-ORDER QUESTIONS THROUGH MICROTEACHING AND A TOKEN ECONOMY

## PURPOSE:

The purpose of this investigation was to analyze the effects of a teaching methodology on the question-asking behavior of elementary school children. The teaching methodology was composed of a modified microteaching approach and a token economy. The behavior to be modified was the frequency of student-initiated, content-related, higher-order question asking. Higher-order questions were considered as those which ask for evaluations, comparisons, problem solving, cause and effect, or divergent thinking.

## RELATED RESEARCH:

The token system of reinforcement has had wide-spread use in remedial and special education classrooms. Its main purpose appears to have been the control of disruptive behavior (Birnbrauer, Wolf, Kidder, and Tague, 1965; Broden, 1970; O'Leary and Becker, 1967; and Philips, 1968). The token economy has also been applied to remedial and special education classrooms to increase academic achievement (Clark, Lackowicz, and Wolf, 1968; Haring and Hauck, 1967; McKenzie, Clark, Wolf, Kothera, and Benson, 1968; Shores, 1969; Staats and Butterfield, 1965; Tyler and Brown, 1968; and Wolf, Giles, and Hall, 1968).

There has been a limited amount of work done to increase academic achievement in the regular classroom through the token system of reinforcement. Increased achievement in spelling has been reported by Benowitz, Martin, and Busse (1970) and by Thompson and Galloway (1970); increased achievement in history and geography has been reported by Glynn (1970); and increased speed and accuracy in the reading of programmed texts by Berman (1967). Other applications of the token system of reinforcement within the regular classroom have been to control disruptive behavior. (O'Leary, Becker, Evans, and Saudargas 1969), and to control study behavior (Bushell, Wrobel, and Michaelis 1968).

A number of studies indicate that the frequency of student-initiated questions is very low. (Houston 1938; Floyd 1960; Dodl 1965; Johns 1968.) Not only are few pupil-initiated classroom questions asked, but those that are raised are generally lower-order in nature. (Taba 1965; Guszak 1966; Gallagher 1965.)

Although there have been attempts to increase student-initiated, higher-order questioning (Farley 1968; Scovel 1968; Johns 1968), this study differs from related work in a number of ways. Review of the literature indicates that this experiment is the first use of a token system of reinforcement to control student-initiated, content-related, higher-order questioning behavior. Moreover, this is the first application of microteaching to train a student population and the first

presentation of symbolic and perceptual models, followed by brief sessions in which the skill to be acquired is practiced. As defined by McDonald and Allen (1967), a symbolic model is one that is written. A perceptual model is one which enables the observer to view another person or persons displaying the skill to be acquired. The curriculum was composed of the following two skills: (1) student-initiated, content-related question asking; and (2) student-initiated, content-related, higher-order question asking.

A second aspect of this experiment consisted of a token reinforcement procedure. Points were used as token reinforcers. The reinforcers for which points could be exchanged were determined by asking the four selected students to name the toys and games and activities they wished to have available. A list of the items was compiled, and the necessary materials were purchased.

Throughout the experiment, two raters were stationed within the fifth grade classroom. Training of the raters consisted of presentation of the symbolic and perceptual models and of verbal instruction in ways to discriminate between content-related and procedural questions, and between higher-order and lower-order questions. Interrater reliability for higher-order questions was .97 and for teacher consequation (teacher response to the higher-order question) was .95.

PROCEDURE:

The dependent variable measure was the number of student-initiated, content-related, higher-order questions asked by the four trained students in their regular classroom. Records were also kept of the number of student-initiated, content-related, higher-order questions asked by the four students not trained in questioning behavior; and of teacher consequation of student-initiated, content-related, higher-order questions. Rate of higher-order question asking by the trained and untrained students was plotted as a frequency distribution over time in terms of the number of higher-order questions asked during each session. Teacher consequation was recorded for each higher-order question asked. Anecdotal records were kept of teacher behaviors exhibited during consequation.

The basic procedure used in this experiment was to present the four selected students with instruction and training in higher-order question asking through the microteaching procedure adapted for students. The higher-order question-asking behavior of these four students was then reinforced in their social studies classroom through a token economy. The five phases of the experiment are described below.

I. Baseline

The two raters analyzed classroom interaction during the social studies class. They kept records of the number of content-related, higher-order questions asked by the trained and untrained students and of teacher consequation of these

questions. Baseline data were gathered in Sessions 1 through 8. No reinforcement for student-initiated, content-related, higher-order questions was administered in this phase.

II. Microteaching

Four microteaching training sessions took place after school. They lasted from 2:30 p.m. to 4:00 p.m. During the first microteaching session, the four students read Symbolic Model 1, Content-related Questions, viewed the four-minute perceptual model, and read the videotape typescript. A ten-minute lesson was taught to the four students. The students were instructed to ask content-related questions during the period of instruction. This short lesson was videotaped, and the number of content-related questions asked was tallied by a supervisor. During this first instructional segment, nine questions were asked by Beth, four by Alane, none by Paul, and none by Amy. The students' performances were discussed with them by the supervisor and the videotape of the lesson was reviewed. Paul and Amy were encouraged to ask more questions. A second ten-minute lesson was taught to the students and the number of questions asked was tallied by the supervisor. During this lesson, nine questions were asked by Alane, six by Beth, two by Paul, and none by Amy. According to the instructor and the supervisor, Beth's decrease in question asking appeared to be caused by the instructor's refusal to recognize her unless she raised her hand.

During the second microteaching session, the lessons were videotaped; questions were tallied; and feedback was given by the supervisor. The lessons taught were remedial, and only Paul and Amy were instructed to ask content-related questions. During the first lesson taught, one question was asked by Paul and none by Amy. During the second lesson, eight questions were asked by Paul, and Amy asked her first question. During the third and fourth sessions, only Amy was instructed to ask questions. She asked two during the third session and three during the fourth. After these four remedial lessons, the four students were presented with Symbolic Model 2, Higher-order Questions. The remainder of this training session was spent in discussion of higher-order and lower-order questions.

During the third training session, the higher-order questioning perceptual model was viewed, and the typescript of the model was read. Further discussion of ways to distinguish between the two types of questions took place. After this discussion, the students visited the store where they examined the displayed items with their attached point values. This session ended with a five-minute lesson in which the asking of higher-order questions was practiced by the students. All four students participated in the ten-minute lesson. Eleven questions were asked by Beth, ten by Alane, eight by Paul, and seven by Amy.

During a 10-minute practice lesson in the last training session, ten higher-order questions were asked by Paul, nine by Alane, eight by Beth, and seven by Amy. It was noted that

questioning behavior had increased markedly from the first to the fourth session for all students except Beth who had begun at a high rate of question asking. During the microteaching phase, data were gathered within the fifth grade social studies class in Sessions 9 through 12.

III. Reinforcement

In this phase, a point was awarded for every content-related, higher-order question asked by a subject within the social studies class. Points could be accumulated over a period of sessions and thus be exchanged for items with a point value higher than that which could be earned in a single session. Reinforcement data were gathered in Sessions 13 through 21.

IV. No Consequation

Reinforcement was terminated in this phase. This phase was an attempt to reverse the effects of the independent variable manipulations made in Phases II and III.

V. Reinforcement II

Experimental Phase III was reinstated. This experimental phase was included to complete the attempted demonstration of reversal of the effects of consequation. During the Reinforcement II Phase, data were gathered in Sessions 28 through 32.

RESULTS ON RATE OF RESPONSE:

The data presented in Figure 1 are based on the mean number of higher-order questions asked per five-minute interval by session for the four students trained in question-asking behavior.

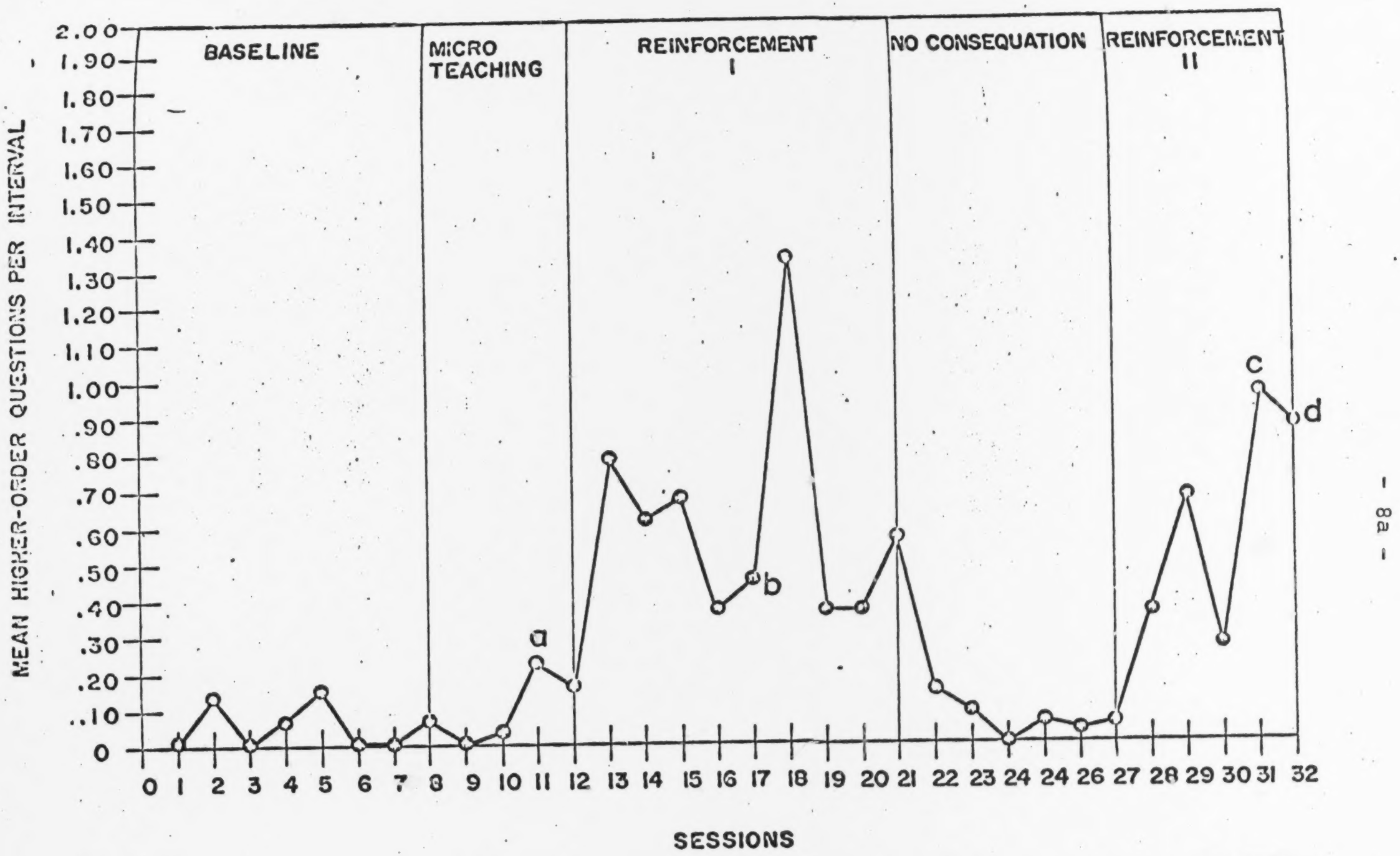


FIGURE 1. MEAN HIGHER-ORDER QUESTIONS PER INTERVAL FOR TRAINED STUDENTS.

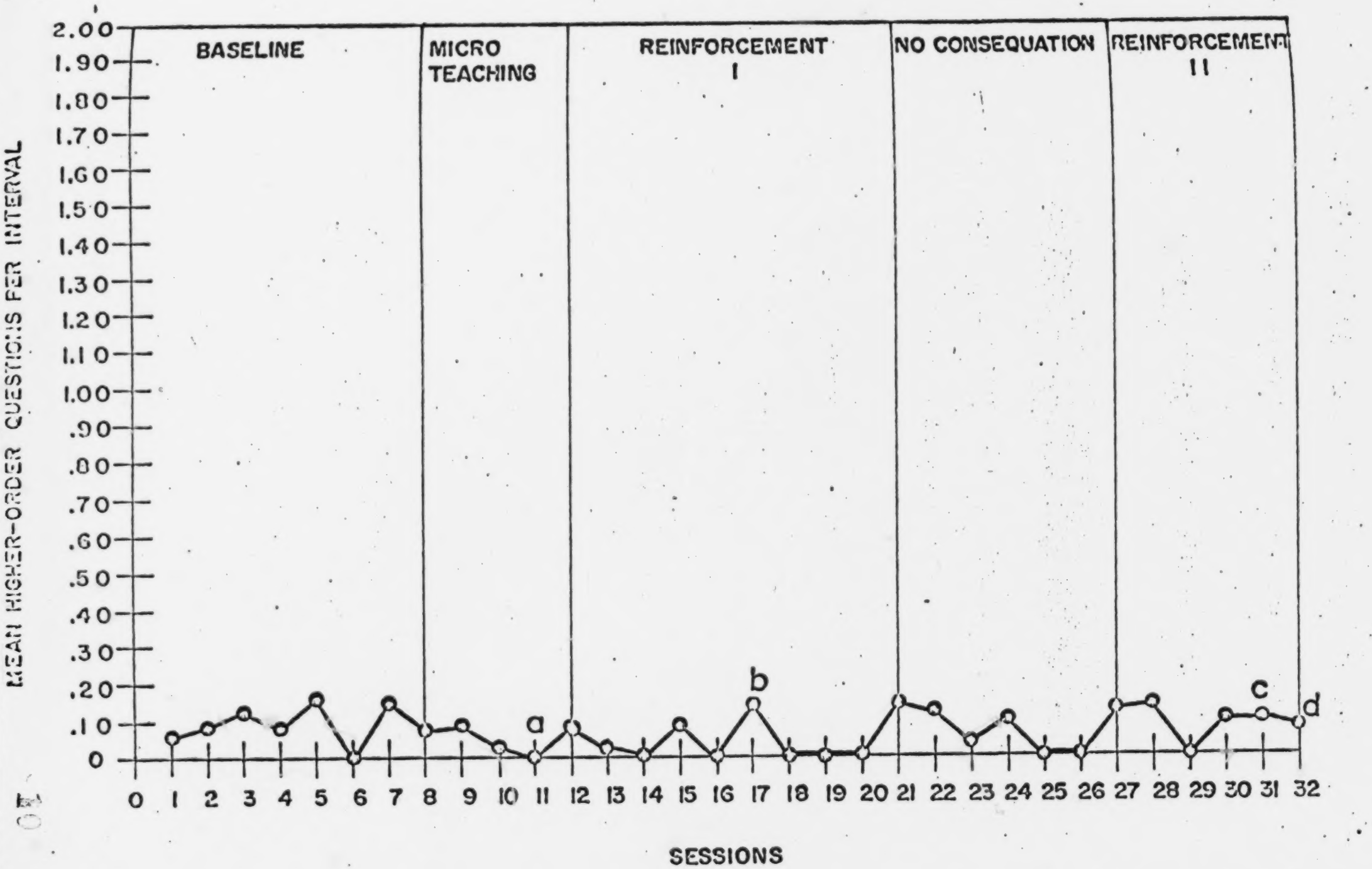


FIGURE 2. MEAN HIGHER-ORDER QUESTIONS PER INTERVAL FOR UNTRAINED STUDENTS.

The data presented in Figure 2 are based on the mean number of higher-order questions asked per five-minute interval by session for the four students not trained in question-asking behavior.

In these figures, special notations occur on four different sessions: (a) in Phase II, immediately preceding Session 11, the trained students were encouraged in their microteaching lesson to ask higher-order questions in their social studies class, even though they would not yet receive points for doing so; (b) in Phase III, Session 17, Alane was appointed class secretary for the period, and much of her time was occupied in note taking; (c) in Phase V immediately preceding Session 31, three of the trained students, Alane, Paul, and Amy, received an extra microteaching session, and the cost of a number of the store's high-value items was reduced; (d) immediately preceding Session 32, Beth, the remaining trained student, received an extra microteaching lesson.

It is indicated by the data that all four trained students increased, to varying degrees, their frequency of higher-order question asking during Phases III and V. The question-asking behavior of the four untrained students remained relatively consistent over the five phases. Table 1 presents the mean higher-order questions per five-minute interval per phase for trained and untrained students.

RESULTS ON RATE RESPONSE BY CATEGORY:

The data presented in Figures 3 and 4 are based on the mean number of higher-order questions asked in each of the categories by the

trained group and by the group not trained, respectively. The category of higher-order questions used most frequently by both groups of students was that of cause and effect. Divergent questions were least often asked by the four students who did not receive training.

TABLE 1

MEAN HIGHER-ORDER QUESTIONS PER FIVE-MINUTE INTERVAL PER PHASE FOR TRAINED AND UNTRAINED STUDENTS

| Students | Base-line | Micro-teaching | Reinforce-ment I | No Conse-quation | Reinforce-ment II |
|---|---|---|---|---|---|
| | | | Trained Students | | |
| Alane | .20 | .35 | 1.02 | .18 | 1.01 |
| Beth | .02 | .08 | .61 | .06 | .82 |
| Paul P. | 0 | 0 | .46 | 0 | .42 |
| Amy | 0 | 0 | .38 | .03 | .28 |
| | | | Untrained Students | | |
| Matthew | .28 | .07 | .05 | .17 | .17 |
| Arthur | 0 | 0 | .09 | .08 | 0 |
| Billy | .02 | .07 | 0 | 0 | .05 |
| Paul W. | .02 | .04 | .01 | 0 | .07 |

The total breakdown of higher-order questioning by category for each group of students is as follows. There were sixteen evaluation, nine comparison, forty-nine problem-solving, 109 cause-and-effect, and three divergent questions asked by the trained students. There were one evaluation, three comparison,

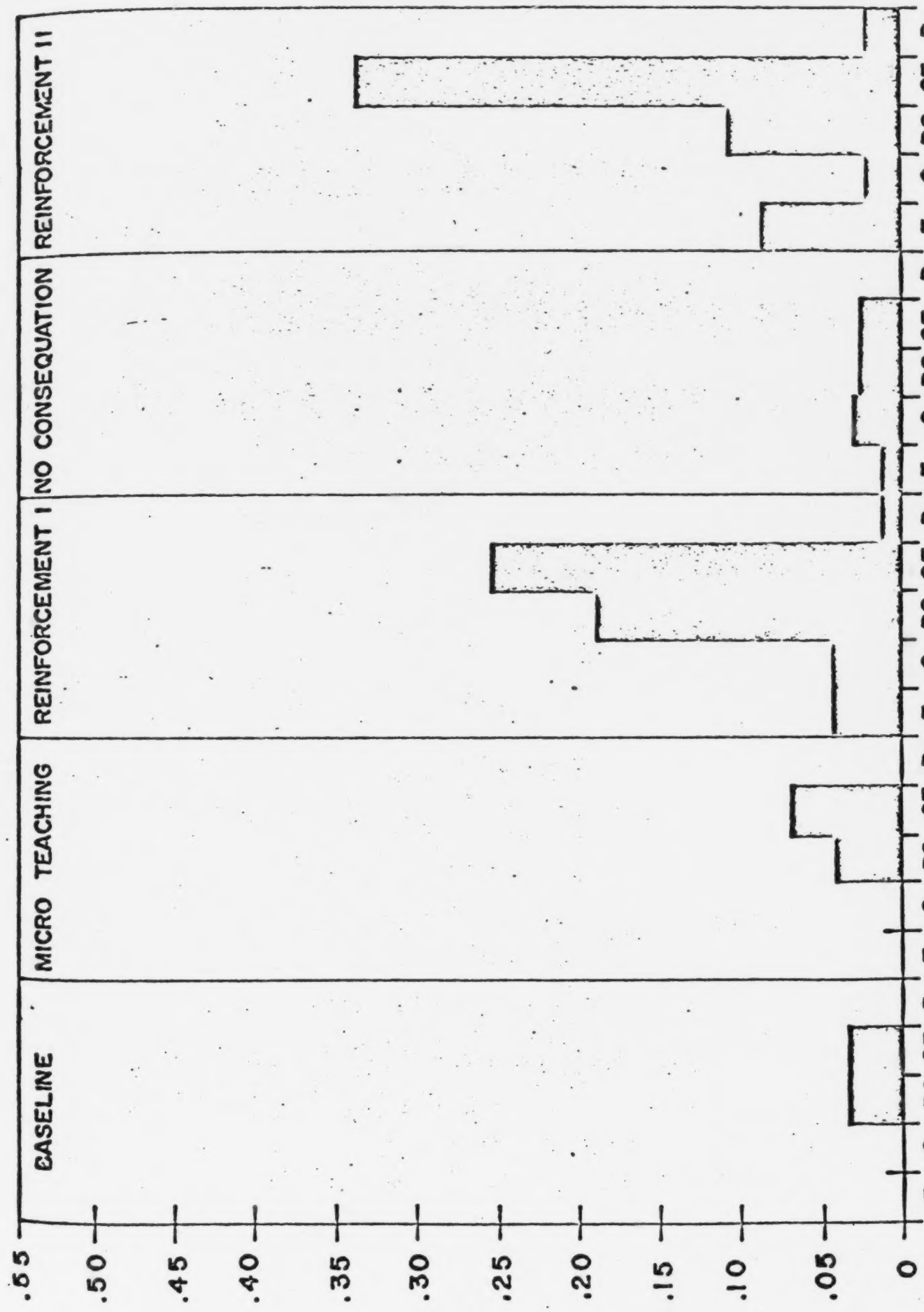


FIGURE 3. TYPES OF HIGHER-ORDER QUESTIONS BY CATEGORY FOR TRAINED STUDENTS.

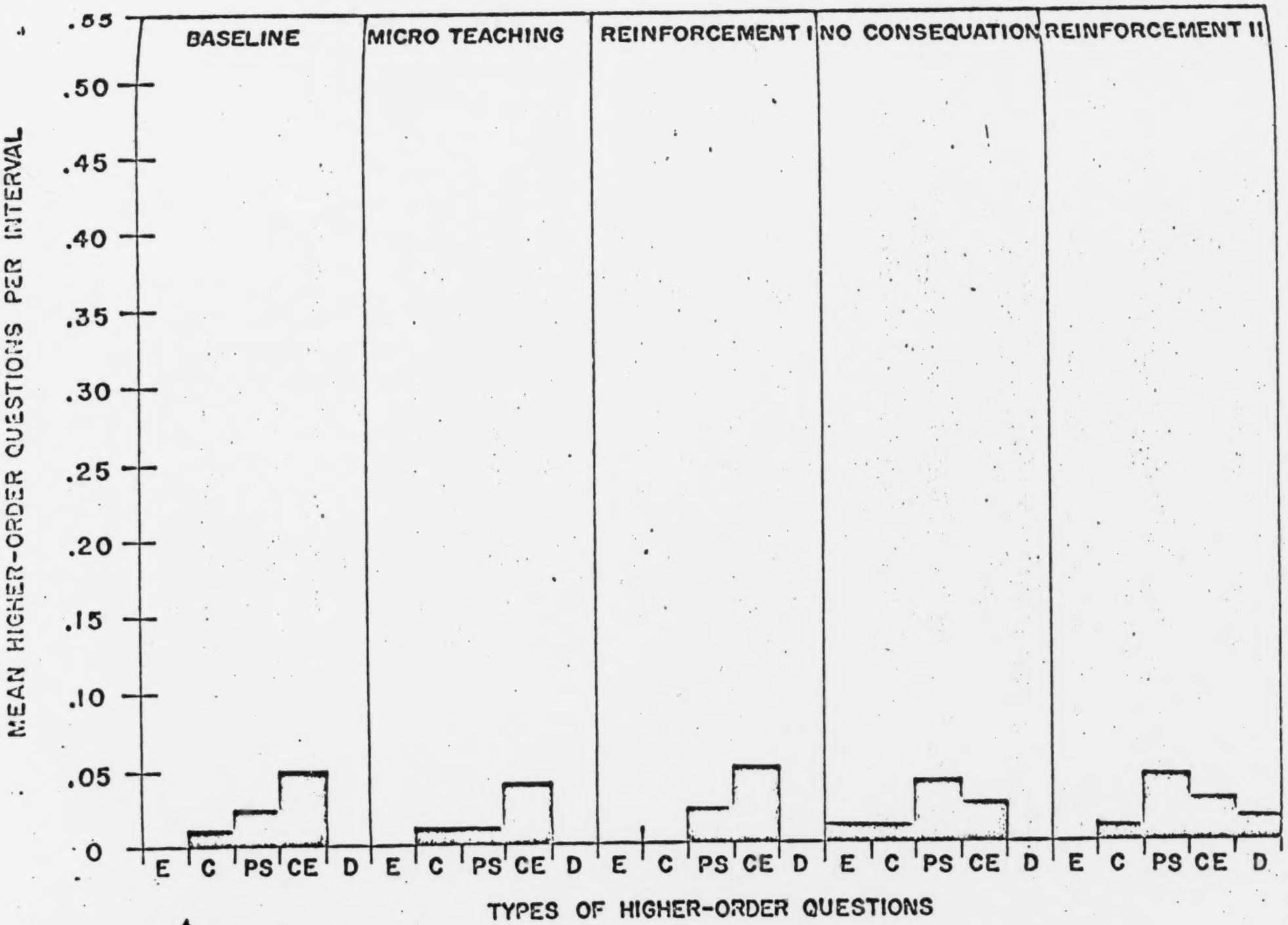


FIGURE 4. TYPES OF HIGHER-ORDER QUESTIONS BY CATEGORY FOR UNTRAINED STUDENTS.

E=EVALUATION C=COMPARISON PS=PROBLEM SOLVING CE=CAUSE/EFFECT D=DIVERGENT

ten problem-solving, fourteen cause-and-effect, and one divergent question asked by the students who were not trained in question-asking behavior.

RESULTS ON TEACHER CONSEQUATION:

During this experiment, 242 higher-order questions were asked by the eight students. Two hundred and forty of these were consequated by the teacher. One failure to consequate occurred during Phase III, and the second failure to consequate occurred during Phase IV. Both were caused by behavior disruptions which diverted the teacher's attention away from the questioning students.

At times, the teacher's response to student-initiated, higher-order questions went beyond direct response to these questions. These verbal comments appeared to fall into four categories. They are as follows: (1) praise, (2) evasion, (3) mild reprimand, and (4) severe reprimand. Praise most frequently consisted of the phrase, "Good question." Seven statements of praise were made by the teacher during the experiment. Evasion generally consisted of responses such as "You're getting ahead," "We'll find out later," "We don't have time to answer questions now--we have to go on." The teacher evaded higher-order questions eight times over the course of the experiment.

Rebukes which did not create a definite pause within the pace of classroom interaction and which did not appear to have a highly negative effect upon the student to whom they were directed were considered as mild reprimands. Six mild reprimands

occurred over the course of the experiment. Rebukes in which the teacher appeared angry, the student seemed frightened or unhappy, and in which a tense pause was created were considered to be severe reprimands. During the experiment, one severe reprimand occurred.

CONCLUSIONS:

The results of this study demonstrate that students can be trained to increase higher-order question asking through the independent variable manipulations put into effect in this experiment. This finding adds to the growing body of research concerned with the use of behavioral principles to manage and maintain the behavior of children who function in regular classrooms. The finding is also congruent with the previously cited studies of Farley (1968), Johns (1968), and Scovel (1968) whose work dealt with raising the frequency of student-initiated, higher-order questions. Further, this study extends their work in that microteaching was introduced as a technique for training students in question-asking behavior and in that verbal, student-initiated, higher-order question asking was maintained over an extended period of time.

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